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## ABSTRACTS OF THE 19TH CONGRESS OF ECHOCARDIOGRAPHY

# Poster session: Right heart

### Obesity effects on right ventricular function

T. Filali, A. Eljary, D. Lahidheb, M. Gommidh, I. Saaidi, N. Hajlaoui, A. Haggui, W. Fehri, H. Haouala  
 Hôpital Militaire de Tunis, Tunis, Tunisia

**Objectives.**— The effect of obesity on left ventricular (LV) characteristics has been previously documented, but much less is known about its effects on right ventricular (RV) function. The aim of this study is to assess the effects of obesity on right ventricular (RV) morphology and function.

**Methods.**— To study the effect of obesity alone, all participants underwent polysomnography to exclude sleep apnea. We included 19 healthy obese subjects ( $BMI > 30 \text{ kg/m}^2$ ) (group 1) and 19 healthy controls ( $BMI < 25 \text{ kg/m}^2$ ) (group 2). All included subjects had no evidence of hypertension, diabetes mellitus or ischemic heart disease. The 2 groups had similar mean ages, mean blood pressures and glucose levels. We used standard echocardiography and tissue Doppler imaging.

**Results.**— RV diastolic diameter, RV ejection fraction, the Tei index and pulmonary arterial pressure were similar in both groups. The tricuspid annulus systolic velocities obtained at the basal RV free wall were significantly decreased in obese subjects ( $7.6 \pm 2.1 \text{ cm/s}$  vs.  $13.6 \pm 2.3 \text{ cm/s}$ ,  $P < 0.01$ ) reflecting the better sensitivity of tissue Doppler to identify subclinical RV systolic dysfunction. Also tricuspid annulus early diastolic velocities were markedly reduced in obese subjects ( $7.0 \pm 1.8 \text{ cm/s}$  vs.  $11.1 \pm 1.9 \text{ cm/s}$ ,  $P < 0.01$ ) with lower ratio of early to late diastolic velocities reflecting impaired relaxation of the RV in obesity ( $0.69 \pm 0.17$  vs.  $1.29 \pm 0.23$ ).

**Conclusion.**— Our data show the presence of subclinical RV dysfunction in obese subjects that was not related to other comorbidities such as sleep apnea. Tissue Doppler imaging is a useful tool to demonstrate RV abnormalities.

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### Bisoprolol effect on the right ventricular function in chronic heart failure

R. Kongo Minga, A. Salih, N. Jardi, F. Belmourida, L. Azzouzi, A. Bennis  
 CHU Ibn Rochd Casablanca, Casablanca, Morocco

Beta-blocker use improves left ventricular ejection fraction (LVEF) in patients with heart failure. A similar effect of beta-blockers on right ventricular function has been proposed, although the effect of Bisoprolol on right ventricular function has not been assessed. This study investigated the short-term effect of Bisoprolol on right ventricular function in chronic heart failure patients. A cohort of 60 heart failure patients who were not taking beta-blockers at baseline was studied prospectively. Right ventricular ejection fraction

(RVEF) and LVEF were measured at both baseline and 6 months by echocardiography. Various parameters of the right ventricular function were measured: Simpson RVEF, surface shortening fraction, right ventricular outflow tract (RVOT %), TAPSE (mm), S' wave with tissue doppler ( $S' \text{ dticm/s}$ ), and the Tei index. The threshold of significance was fixed at 5%. Bisoprolol was up titrated during six months by a preestablished protocol to a target dose of 10 mg/Od. Mean age was  $65.7 \pm 16.3$  years. Baseline RVEF was  $25.6 \pm 5.2\%$  and baseline LVEF was  $20.8 \pm 6.4\%$ . Mean Bisoprolol dose reached was  $25 \pm 12.5 \text{ mg}$  daily. At 12 months, RVEF was significantly increased by 7.5% (95% confidence interval, 3.9–10.2;  $P = 0.0001$ ) and LVEF also increased significantly by 7.5% (95% confidence interval, 4.0–11.9%;  $P = 0.0003$ ). All the parameters of the right ventricular function were significantly improved: TAPSE ( $15.5$  vs  $12.7$ ;  $P = 0.078$ ), Doppler  $S' \text{ dticm/s}$  ( $10.7$  vs  $8.2$ ;  $P = 0.002$ ), Tei index ( $54.10$  vs  $81.45$ ;  $P = 0.0008$ , RVOT % ( $27.1$  vs  $19.3$ ;  $P = 0.036$ ),  $dp/dt \text{ RV}$  ( $721$  vs  $505$ ;  $P = 0.05$ ). The efficacy and good tolerance of bisoprolol is demonstrated in this study on chronic heart failure with right ventricular dysfunction when administered in a precise pattern.

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### Assessing right ventricular function: Cardiac MSCT scan versus transthoracic echocardiography (TTE)

L. Christiaens, B. Bonnet, J. Mergy, D. Coisne, J. Allal  
 DMC Cardiologie, CHU de Poitiers, Poitiers, France

**Objectives.**— Assessing right ventricular (RV) function is still a challenge. MRI is considered as gold standard but not available in many times. We used a strategy based on systematic multiparametric approach to assess RV function compared with MSCT scan evaluation known to be well correlated to MRI.

**Patients and methods.**— From December 2009 to April 2010, 57 patients (mean age  $56.7 \pm 13$ , male 63,15%) have been referred to our institution to perform non invasive coronary arteries angiography using 64-MSCT. Three-dimensional RV ejection fraction (RVEF) was measured using commercially available software. Right ventricular fractional area change (RVFAC) was measured in axial plane and reconstructed in apical 4 chambers view. We also measured in the same views tricuspid annular plane systolic excursion (Scan TAPSE). TTE was performed the same day to assess RV parameters according to the more recent guidelines: tricuspid annular plane systolic excursion (TAPSE), tricuspid annular peak systolic velocity in Tissue Doppler Imaging (Sa tricuspid annulus), myocardial performance index (Tei index), right ventricular fractional area change (RVFAC). We studied correlations between TTE parameters and cardiac 64-MSCT scan. Right ventricular dysfunction was assessed using at least two parameters in TTE.

**Results.**— Hemodynamic conditions were similar before both exams. We found good correlations between: RVEF measured by MSCT scan and RVFAC in TTE ( $Rho=0.53$ ;  $P=0.002$ ); RVFAC measured by MSCT scan in axial view and RVFAC in TTE ( $Rho=0.59$ ;  $P=0.0006$ ); RVFAC measured by MSCT scan in apical 4 chambers view and RVFAC in TTE ( $Rho=0.58$ ;  $P=0.0007$ ); TAPSE scan measured by MSCT scan in axial view and Sa tricuspid annulus in TTE ( $Rho=0.60$ ;  $P=0.0002$ ); TAPSE scan measured by MSCT scan in apical 4 chambers view and Sa tricuspid annulus in TTE ( $Rho=0.63$ ;  $P<0.0001$ ). Assessing RV function by systematic multiparametric TTE strategy had a 50% sensibility and a 89,7% specificity to predict RVEF less than 35% in cardiac 64-MSCT scan with a 94,59% negative predictive value.

**Conclusion.**— We showed that TTE parameters used to assess RV function had good correlations with modern parameters derived from a standard 64-MSCT cardiac scan. A systematic multiparametric strategy in TTE had a high negative predictive value of RV dysfunction assessed by 64-MSCT cardiac scan. The prognostic value of such a strategy should be evaluated in prospective studies in different clinical issues like risk stratification before cardiac adult surgery or after a pulmonary embolism.

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#### Echocardiographic assessment of the right ventricle during inferior myocardial infarction

R. Hammami<sup>a</sup>, L. Zakhama<sup>b</sup>, S. Naffeti<sup>b</sup>, L. Abid<sup>a</sup>,

S. Ben Youssef<sup>b</sup>, S. Kammoun<sup>a</sup>

<sup>a</sup> Service de cardiologie de Sfax, Sfax, Tunisia

<sup>b</sup> Service de FSI La Marsa, Marsa, Tunisia

**Objectives.**— The right ventricle infarction (RVI) may complicate 40 to 50% of inferior myocardial infarction. The purpose of this study was to evaluate the contribution of echocardiography to detect right ventricle ischemia during an inferior myocardial infarction.

**Patients and methods.**— This is a prospective study including all patients hospitalized for a first inferior myocardial infarction (P group) between January 2010 and November 2010. A right ventricle infarction was defined by an ST elevation of 1 mm or more in right leads (V3R, V4R). All patients underwent Doppler echocardiography during the first 48 hours and were compared to healthy subjects (S group).

**Results.**— The average age of our patients was  $59.94 \pm 13$  years with a male predominance. Ten patients had electrical extension to the right ventricle (32.25%). The echocardiographic study of right ventricular function showed a significantly lower systolic function in patients than in healthy subjects (right ventricle ejection fraction: P group=51.13%, S group= 66%,  $P<0.001$ ). The movement of the tricuspid annulus TAPSE was significantly lower in patients than healthy subjects (P group=16.24 mm, S group=21.32 mm,  $P<0.001$ ). Among patients, the TAPSE was significantly lower in case of RVI ( $RV+=12.22$ ;  $RV-=18.16$ ,  $P<0.001$ ). Similarly, the systolic wave velocity at lateral wall of the tricuspid annulus was significantly reduced in patients compared to healthy subjects (P group=12.13 cm/s, S group=17.56 cm/s,  $P=0.05$ ), and was even lower in patients with RVI compared to the others patients ( $RV+=11.87$  cm/s;  $RV-=13.5$  cm/s,  $P<0.001$ ).

**Conclusion.**— Our study demonstrates that the TAPSE and the systolic wave velocity at tricuspid annulus are simple methods for the early diagnosis of right ventricle ischemia during an inferior.

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#### Importance of challenging right side ventriculo-arterial interactions in advanced heart failure patients

N. Piriou, J. Roy-Giocola, F. Floch, J.-P. Gueffet, J.-N. Trochu

Institut du thorax, Nantes, France

**Objectives.**— Pulmonary hypertension (PH) and right ventricular (RV) systolic dysfunction are two prognostic factors in advanced heart failure (AdHF). RV and pulmonary artery coupling is one of

the main determinants of global RV systolic function. Assessment of PH reversibility is routinely performed and uses different pharmacological protocols. Conversely, RV contractile reserve response during such pharmacological challenges has not been described. Our study compared RV contractile reserve during isolated inhaled nitric oxide (iNO) challenge or comprehensive pharmacological test with diuretics, nitrates and positive inotropes in AdHF patients (pts) addressed for PH reversibility testing.

**Methods.**— All AdHF pts addressed in our institution for PH reversibility testing from November, 2009 till July, 2010 were screened. We included after informed consent every pts with a mean pulmonary arterial pressure (PAP)  $\geq 25$  mmHg. iNO testing was performed after basal measurements, followed by a comprehensive pharmacological test after 15 minutes of wash-out. RV systolic function was assessed at each step from transthoracic echocardiography with TAPSE and the maximal velocity of the systolic wave of tricuspid annulus in tissue doppler (Sa). Contractile reserve was defined as the difference between post-test TAPSE or Sa and basal or post-wash out TAPSE or Sa ( $\Delta$ TAPSE,  $\Delta$ Sa).

**Results.**— Nineteen pts were included. Mean left ventricular ejection fraction was  $22 \pm 3\%$ . Mean PAP was  $40 \pm 6$  mmHg; pulmonary vascular resistances (PVR) were  $4 \pm 2$  Wood Units. TAPSE was  $14 \pm 5$  mm, Sa was  $10 \pm 3$  cm/s. iNO had no significant effect on both PAP and PVR, and RV systolic function. Comprehensive pharmacological testing showed a significant decrease in mean PAP ( $-38.1\%$ ,  $P<0.001$ ), PVR ( $-39.6\%$ ,  $P=0.03$ ), and a significant RV contractile reserve (TAPSE:  $+22\%$ ,  $P=0.004$ ; Sa:  $+12\%$ ,  $P=0.03$ ). In a subgroup of 11 pts with basal Sa  $\leq 10$  cm/s, PAP and PVR at baseline were not different from the whole population of the study, and iNO did not reverse PH but led to a significant RV contractile reserve ( $\Delta$ TAPSE:  $+2.5 \pm 2$  mm;  $\Delta$ Sa:  $+1 \pm 0.05$  cm/s).  $\Delta$ Sa with iNO was correlated with  $\Delta$ systolic PAP ( $r=-0.619$ ,  $P=0.04$ ) and  $\Delta$  transpulmonary pressure gradient ( $r=-0.533$ ,  $P<0.05$ ).

**Conclusion.**— As previously described by our team, isolated iNO challenge fails to prove PH reversibility in AdHF pts. However, iNO induces a significant RV contractile reserve in pts with the more altered RV, which is correlated to PAP and PVR decrease. These findings underline the importance of targeting ventriculo-arterial interaction in RV failure in AdHF, particularly in the more severe pts.

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#### Assessing right ventricular systolic function in a population of unselected patients before cardiac surgery: A multiparametric approach is mandatory

J. Peyrou, M. Simon, C. Chauvel, E. Bogino, P. Dehant, M. Jimenez, E. Abergel

Clinique Saint-Augustin, Bordeaux, France

**Background and aim.**— Assessment of right ventricular (RV) function is of prognostic value in patients undergoing cardiac surgery. In recent American guidelines, 2 definitions for the diagnosis of RV dysfunction are validated: (1) peak systolic velocity during ejection period (Sa)  $< 10$  cm/s (2) RV fractional shortening (RVFS)  $< 35\%$ . The aim of our study was to assess these recent recommendations in a large non-selected cohort of patients awaiting cardiac surgery.

**Methods.**— Two hundred and sixty seven patients (means values of age and LVEF respectively: 69 years [33–88] and 64% [10–89]) were enrolled of which 49% were awaiting coronary artery bypass grafting and 51% valve surgery. Conventional Echocardiography was performed in all. In addition, RVFS, Sa and RV Tei index were assessed. RVFS was obtained from an apical 4-chamber view focused on the RV by tracing RV endocardium in systole and in diastole. Sa as a simple and reproducible indice was recorded by pulsed-wave tissue Doppler in an apical 4-chamber view on a narrowed sector of the tricuspid annulus and the basal RV free wall in order to obtain the highest systolic velocity. RV Tei index was obtained by the pulsed-wave tissue Doppler method in an apical 4-chamber view. The Doppler sam-